

Ruddiman Creek

Bacteria Source Tracking Project

October 22, 2013

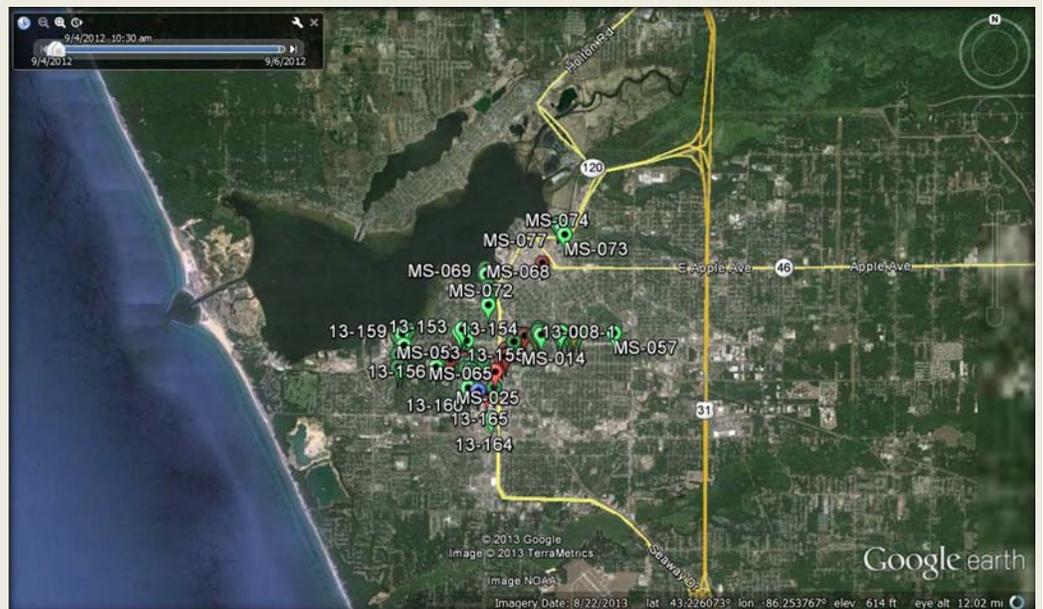
Prepared for:

West Michigan Shoreline Regional Development Commission



Prepared by:

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Background

Environmental Canine Services LLC (ECS) is a Michigan based environmental consulting company that uses scent trained canine for the detection and source tracking of human source fecal contamination. The canine is trained to alert the handler when human fecal contamination is present in surface waters, storm drain systems or soil samples. Since 2009 ECS has successfully completed over 20 source tracking projects in six states.

In early 2012 ECS was contacted by Kathy Evans with the West Michigan Shoreline Regional Development Commission (WMSRSC) to assist with bacterial source tracking regarding the TMDL on the Ruddiman Creek in Muskegon Michigan.

On August 28-29 of 2012, Scott Reynolds and canine Sable assisted WMSRDC and the Michigan Department of Environmental Quality (MDEQ), in cooperation with the City of Muskegon and Muskegon Heights, with illicit discharge investigations.

A total of 66 sites were investigated by canine Sable. Of those 65 sites 60 were parts of the stormwater system or samples taken from that system. The remaining five sites were known sanitary sewers and used as a “calibration”.

From the 60 stormwater sites investigated canine Sable gave seven alerts for the presence of human fecal bacteria. One alert was associated with detergents. All positive alert sites are listed below:

- MS-001 Hackley east of Glade at entrance to Marathon station (detergents)
- MS-002 Lemuel approx. 240-feet north of Hackley in grass
- MS-003 Lemuel approx. 200-feet north of dead end, 20 ft. west of rail road
- MS-025 Approx. 170-feet NE of the dead end of Beidler
- MS-032 W. Hackley north of Stein in grass between drives to the Polish Falcon Lodge
- MS-043 On Hackley between two entrance drives to Heartland
- MS-048 W. Hackley and Vandinther south side grass
- MS-049 W. Hackley, west of Vandinther south side grass

Six field replicates were conducted from randomly selected sites. Sable duplicated the alert responses for all six sites. Two of the six sites again received a positive response for the presence of human fecal:

- MS-001
- MS-025

After analyzing the results of the 2012 project, ECS made recommendations that follow up investigations be conducted in specific target areas:

- Is it recommended that the city of Muskegon investigate the storm line from Young Avenue south to W. Hackley. A positive canine alert was also given at the manhole off of Beidler (MS025). If these are connected the investigation should be extended to include this area.
- While not a source of *E. coli* the Marathon carwash at W. Hackley and Glade has a discharge going to the catch basin connected to MS001 on W. Hackley and is impacting overall water quality.
- Multiple positive canine alerts were given at storm manholes on W. Hackley between Dowd and Barclay. The streets were under construction during the investigation and connectivity between storm and sanitary structures seemed to be in question. It is recommended that after construction is complete the City of Muskegon conduct further investigations to determine connectivity and the track potential illicit discharges in this area.
- Two positive canine alerts were given at storm manholes on W. Hackley in front of Glenside School. This area should be investigated during the active school year allowing for identification of illicit discharges during peak flows.

2013 follow up investigation

Ms. Evans of WMSRDC contacted ECS in September of 2013 and requested additional canine source tracking for the Ruddiman Creek. On October 22, 2013 Reynolds and canine Sable conducted a follow up investigation with the MDEQ and the cooperation of the City of Muskegon.

For reporting purposes the following conditions apply regarding maps:

- Green icons indicate a negative response from the canine
- Red icons indicate a positive alert for human fecal contamination
- Yellow icons indicate a specific situation where the canine gave conflicting responses
- Blue icons indicate the canine did not sniff, but observations indicate a need for additional follow up

For reporting purposes the following conditions apply regarding number of sites:

- All numbers for the 2013 investigations will start with 13-0**
- All sites revisited in 2013 will contain the number of the 2012 site for match and comparison, i.e. 13-002
- New sites visited in 2013 were assigned a random number
- Number sequences do not indicate connectivity of stormwater drains and should be confirmed with City of Muskegon before conducting follow up investigations

Results

A total of 39 sites were investigated. Of the 39 sites, nine from the 2012 investigation were re-visited during this project. All responses matched the 2012 responses at these nine locations. Four positive alerts and five negative responses were given. Of the remaining 30 sites investigated canine Sable gave

nine additional positive alerts to the presence of human fecal contamination in the storm drain outlined in Table 1.

Table 1. K9 responses to IDDE				
<i>Structure ID</i>	<i>Date</i>	<i>K9 Alert</i>	<i>Location</i>	<i>Comments</i>
13-002	10/22/13	Y	Lemuel approx. 240-feet north of Hackley in grass 43.21324,-86.25819	Match 2012 ID MS-002
13-003	10/22/13	Y	Lemuel approx. 200-feet north of dead end, 20 ft. west of rail road. 43.21457,-86.25805	Match 2012 ID MS-003
13-005	10/22/13	N	Young Ave. south of cemetery in grass 43.21614, -86.25569	Match 2012 ID MS-005
13-005-1	10/22/13	N	Young Ave. N. side 43.21608, -86.25573	New site
13-007-1	10/22/13	Y/N	In front of 239 W. Holbrook	New site
13-008	10/22/13	N	W. Holbrook and Commerce SW corner in grass 43.21745, -86.24945	Match 2012 ID MS-008
13-008-1		N	W. Holbrook between Commerce and 5 th	New site
13-010		N	Commerce and W. Alpha 43.21814, -86.24948	Match 2012 ID MS-010
13-026		N	W. Hackley and Crowley 43.21264, -86.26419	Match 2012 ID MS-026
13-130		Y	W. Hackley and Dowd	New site
13-131		N	In front of 2145 Dowd	New site
13-037-1		N	In front of 2247 Dowd	New site
13-138		N	Dowd at Pulaski Ave right of way 43.21088, -86.26866	New site
13-038-1		N	Dead end of Pulaski btwn Kinsey and Dowd. 43.20911, -86.2666	New site
13-043		Y	Between two entrance drives to 1061 W. Hackley. Heartland 43.21269, -86.26948	Match 2012 ID MS-043
13-043-1		N	NW corner of W. Hackley and Barclay	New site
13-047		N	W. Hackley and Parslow ,NE corner 43.21280, -86.27289	Match 2012 ID MS-047
13-048-1		Y	W. Hackley and Parslow, south side grass 43.2127, -86.27289	New site
13-150		Y	Young at Barclay	New site
13-151		Y	Young at Nevada	New site
13-152		N	In front of 1935 Nevada	New site
13-153		N	In front of 1879 Nevada	New site
13-154		N	Barclay at Windsor	New site

Table 1 cont.

<i>Structure ID</i>	<i>Date</i>	<i>K9 Alert</i>	<i>Location</i>	<i>Comment</i>
13-155		N	Young at Franklin	New site
13-156		N	McGraft Park and Addison NE grass 43.21538, -86.28515	New site
13-157		Y	SW corner CB Addison at Lakeshore	New site: possible interference from pump station
13-158		Y	NE corner CB Addison at Lakeshore	New site: see 157
13-159		N	Addison south of Lakeshore	New site. Rules out 13-157/58
13-160		N	Lakeshore and Bourdon	New site
13-161	10/22/13	N	Lakeshore at Frisbee in turn lane	New site
13-162		N	Glen and Bourdon	New site
13-163		N	In front of 2169 Bourdon	New site
13-164		N	Broadway N. of Henry SB Lane 43.201268, -86.26196	New site
13-165		Y	Henry N. or Sherman 43.206180, -86.263372	New site
13-166		-	Behind Save-a-Lot NW parking 43.20666, - 86.26543	New site: heavy, warm DWF & odor
13-167		Y	Park St. in front of Greater Muskegon Transfer 43.217255, -86.254455	New site
13-168		N	Park St. in front of Greater Muskegon Transfer 43.21736, -86.25431	New site not connected to 13-167
13-169		Y	In lot behind 1922 Park St at dead end of 9 th	New site
13-170		N	Ruddiman Creek footbridge	New site 12" SDR pipe.

Three sites have additional information that should be noted. Structure ID #s 13-157 and 13-158 received a positive alert from canine Sable. It is thought that wind direction and proximity of the pump station on Lakeshore may have contributed to the alert. Upstream investigation at 13-159 received a negative response.

Observations by MDEQ, the City of Muskegon and Reynolds found continuous heavy dry weather flow from the SW pipe in Structure ID # 13-166. It was immediately noticeable that the temperature of the air coming from the structure was greater than the ambient temperature. In addition the air was accompanied by an odor not consistent with clean water stormwater.

Recommendations

ECS makes the following recommendations in addition to the recommendation described in the *Background* section at the beginning of this report. These recommendations are based on discussions with field crews, canine responses and handler's observations during the 2012 and 2013 projects. Corresponding maps can be found in Appendix A.

- MS-001: According to City of Muskegon DPW, the gas station car wash is no longer in operation. It is recommended and the city arrange to dye test the bathrooms to ensure the 2012 alert was not sewage related, but instead was a product of surfactants from the car wash.
- 002-003 series: It is recommended that dye testing or camera work be conducted to locate the source of human fecal contamination in the reach from the railroad tracks south along Lemuel to W. Hackley (Figure 1).
- 030 and 130 series: Dye testing/camera work should be conducted on W. Hackley between Barclay and Dowd to locate source of human fecal contamination on stormdrain. Three canine responses match the 2012 project results and one additional new positive alert at 13-130 (Figure 2).
- 048-049 series: Dye testing/camera work needs should be conducted on south side of W. Hackley in front of the school.
- 150-151 series: Dye test/camera work should be conducted on Nevada from site 13-152 to Young and from site 13-155 to site 13-151 (Figure 3).
- Further investigation is needed to find the source of the dry weather flow from SW pipe at site 13-166 behind Safeway. ECS recommends water sampling for *E. coli*. (Figure 4).
- Additional investigation should be conducted to find the source of human fecal contamination at site 13-167 (Figure 4).
- Series 167-169: Additional investigation is needed to determine the connectivity of the storm sewer behind the Greater Muskegon Transit building. Dye/camera work should be conducted to determine the source of the human fecal contamination (Figure 1).
- Additional investigation and sampling is needed on W. Holbrook east of 6th street. In 2012 Sable had difficulty with committing to an alert at manholes in this area. This same behavior was repeated again in 2013 (Figure 5).
- Regarding sites 13-157/158, it is recommended that an *E. coli* test be conducted to insure the positive canine alerts were an anomaly (Figure 6).

Appendix A

Follow up maps and site locations needing additional investigations:

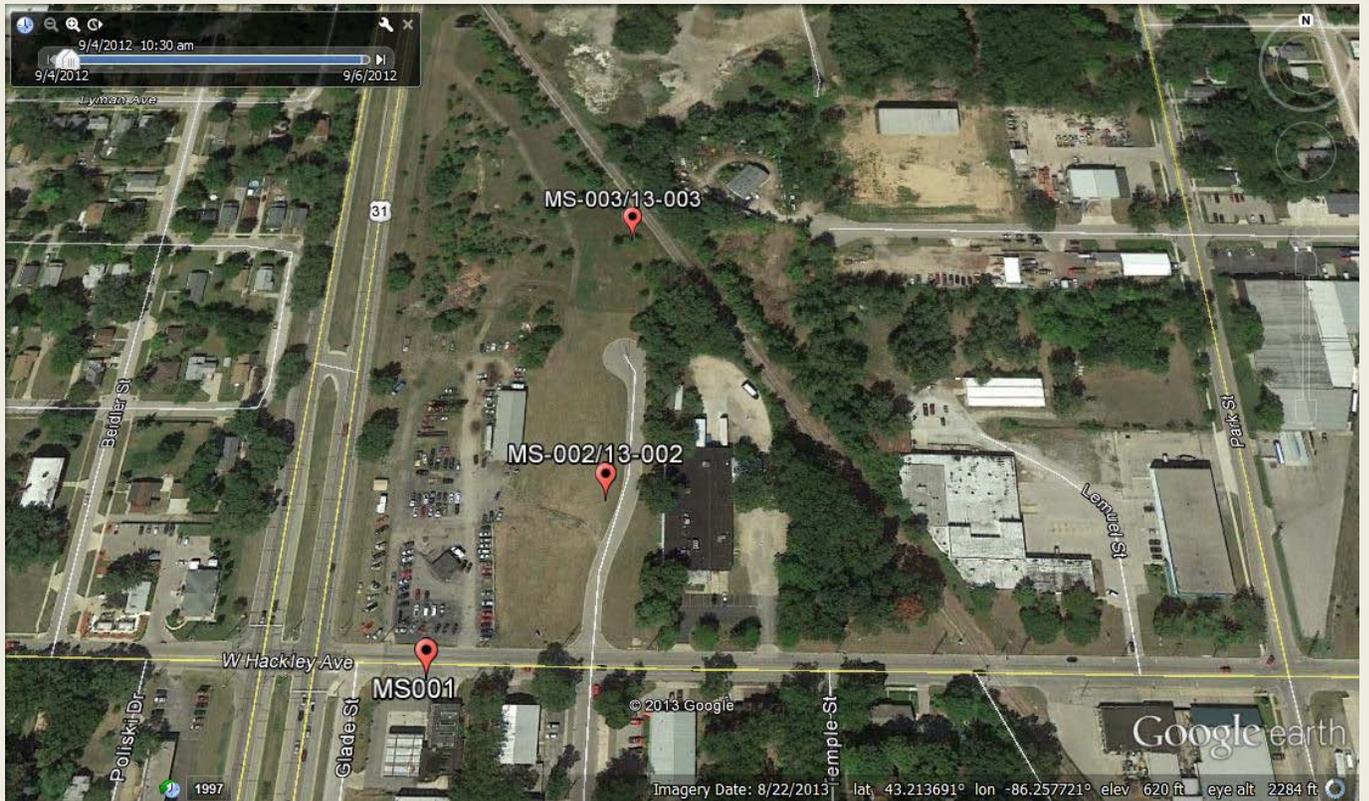


Figure 1 W. Hackley and Lemuel

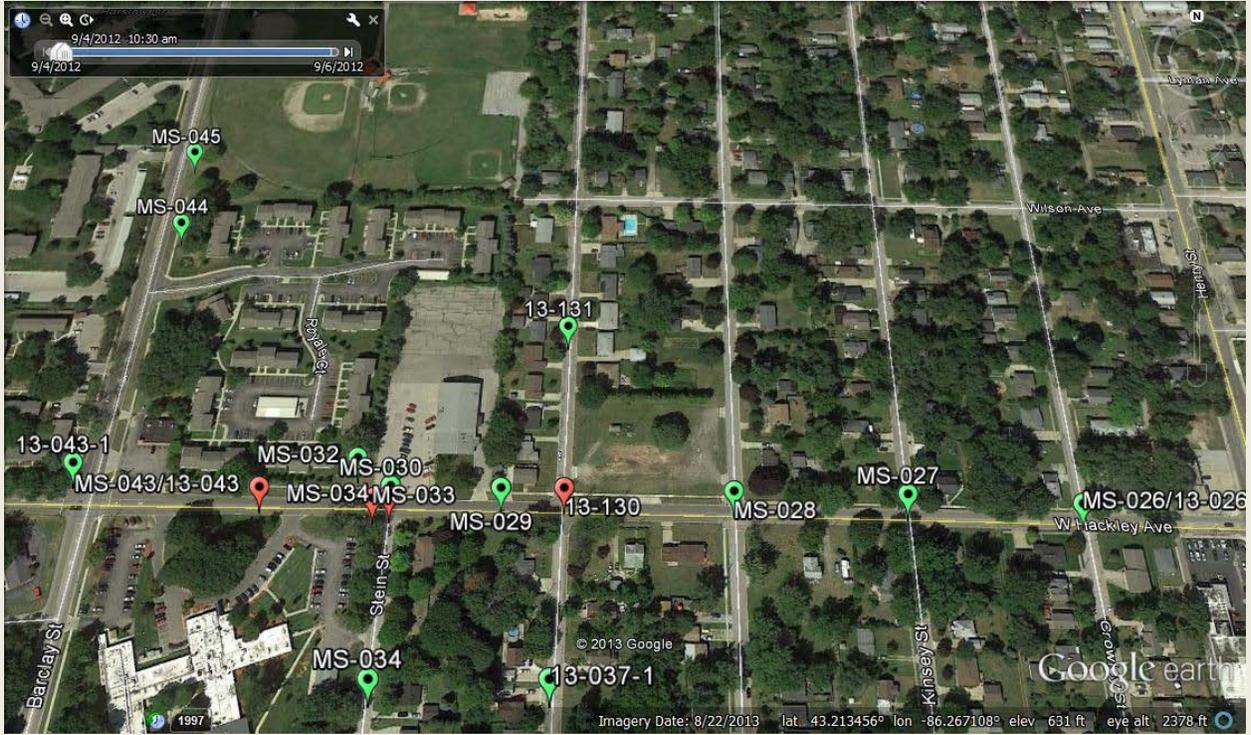


Figure 2. W Hackley, Barclay to Dowd

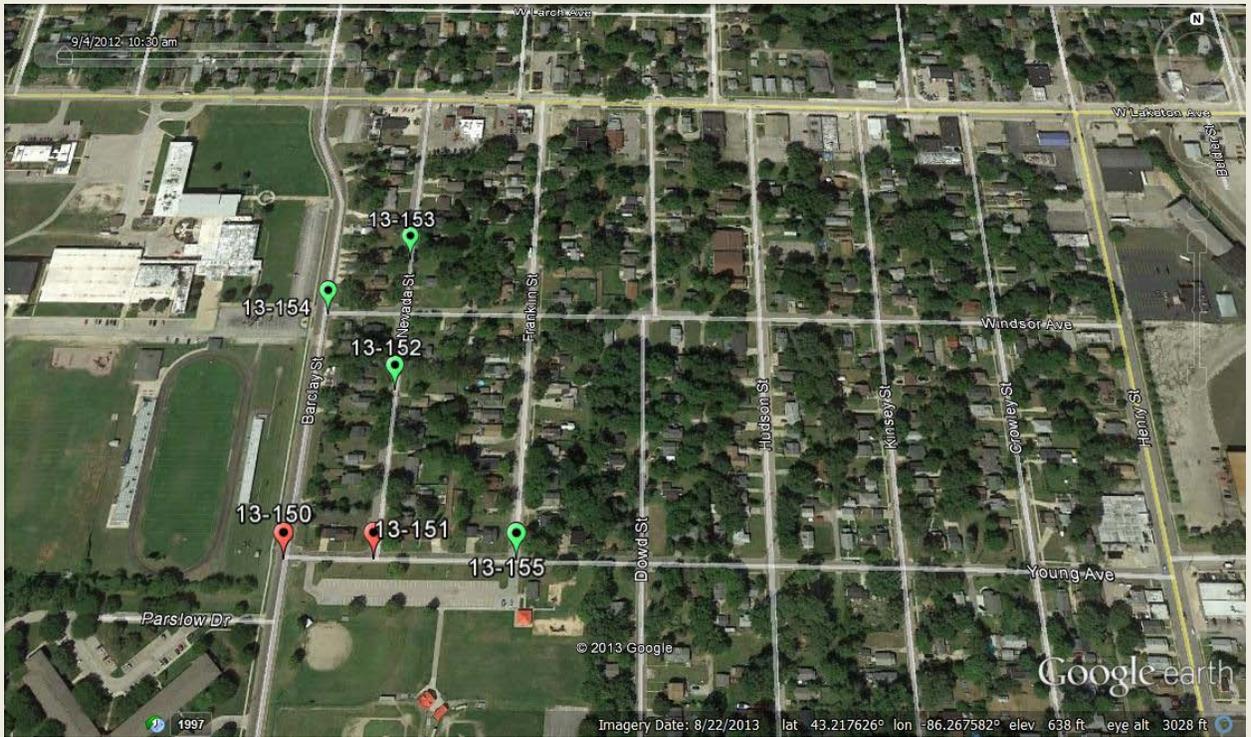


Figure 3. Young and Nevada

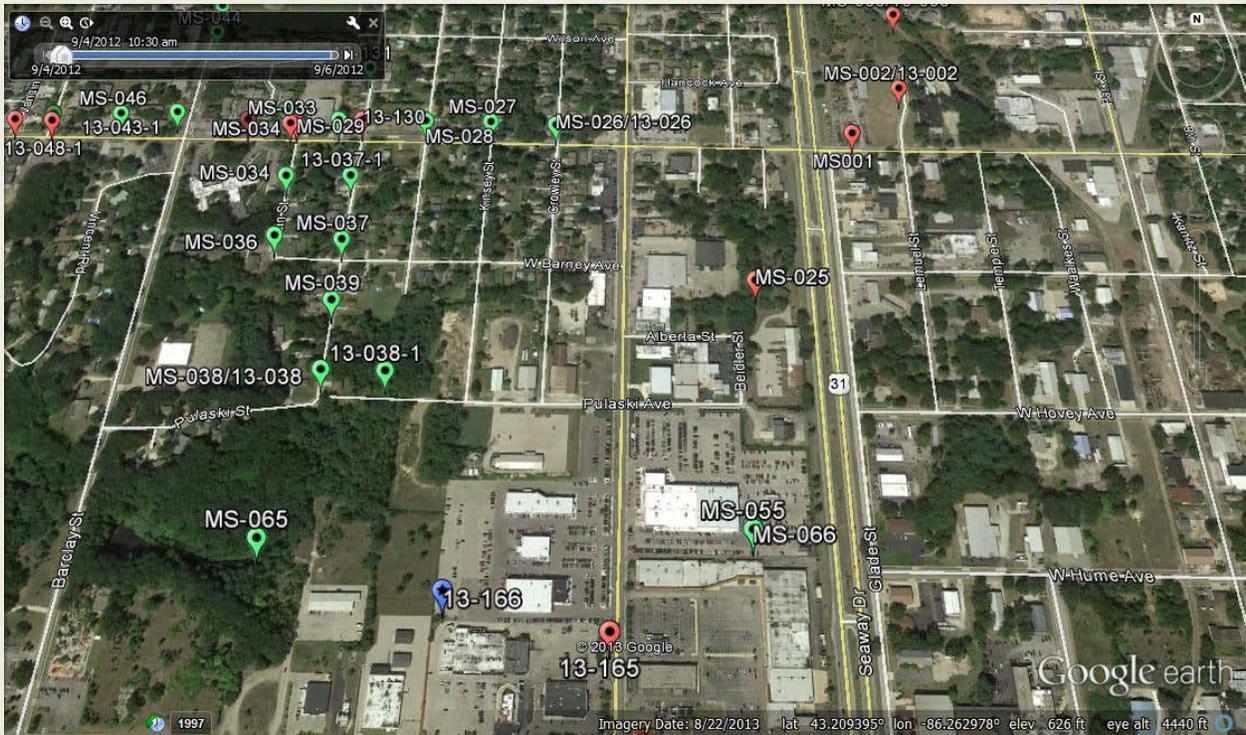


Figure 4. Henry and Sherman- Safeway



Figure 5. Holbrook east of 6th

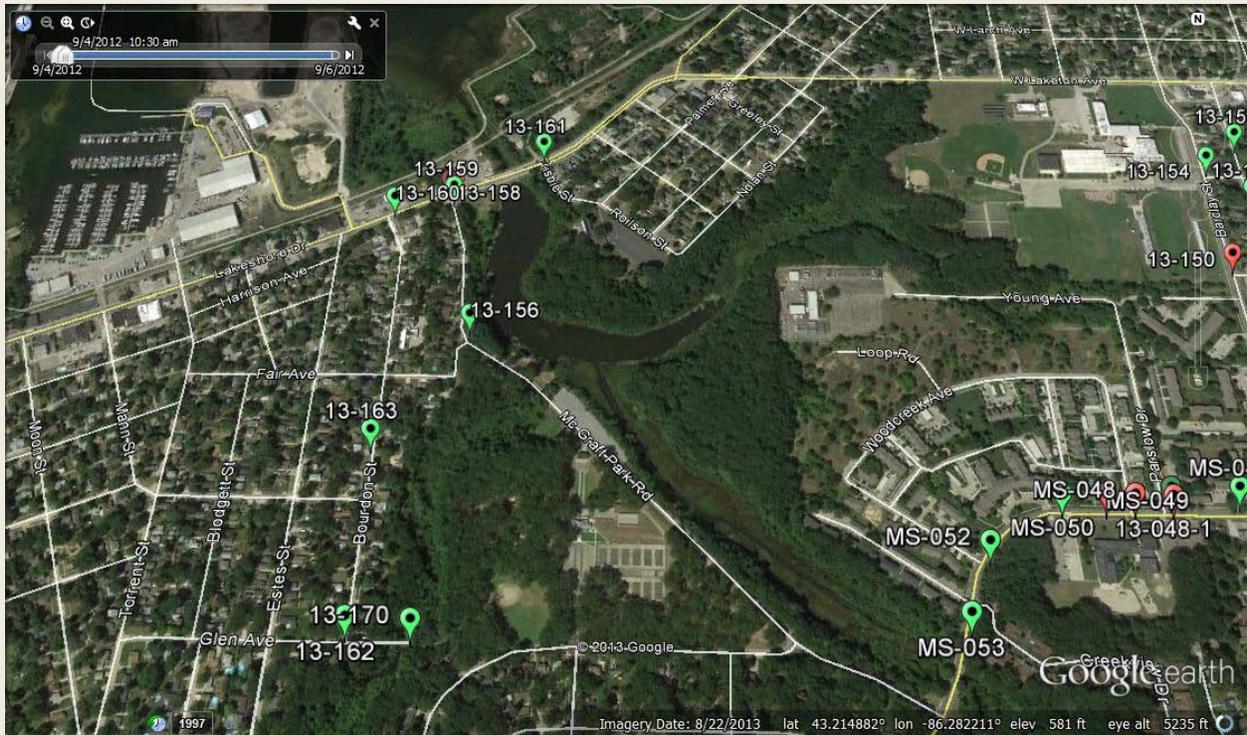


Figure 6. Lakeshore and Addison

Appendix B

Supplemental maps showing negative response areas:

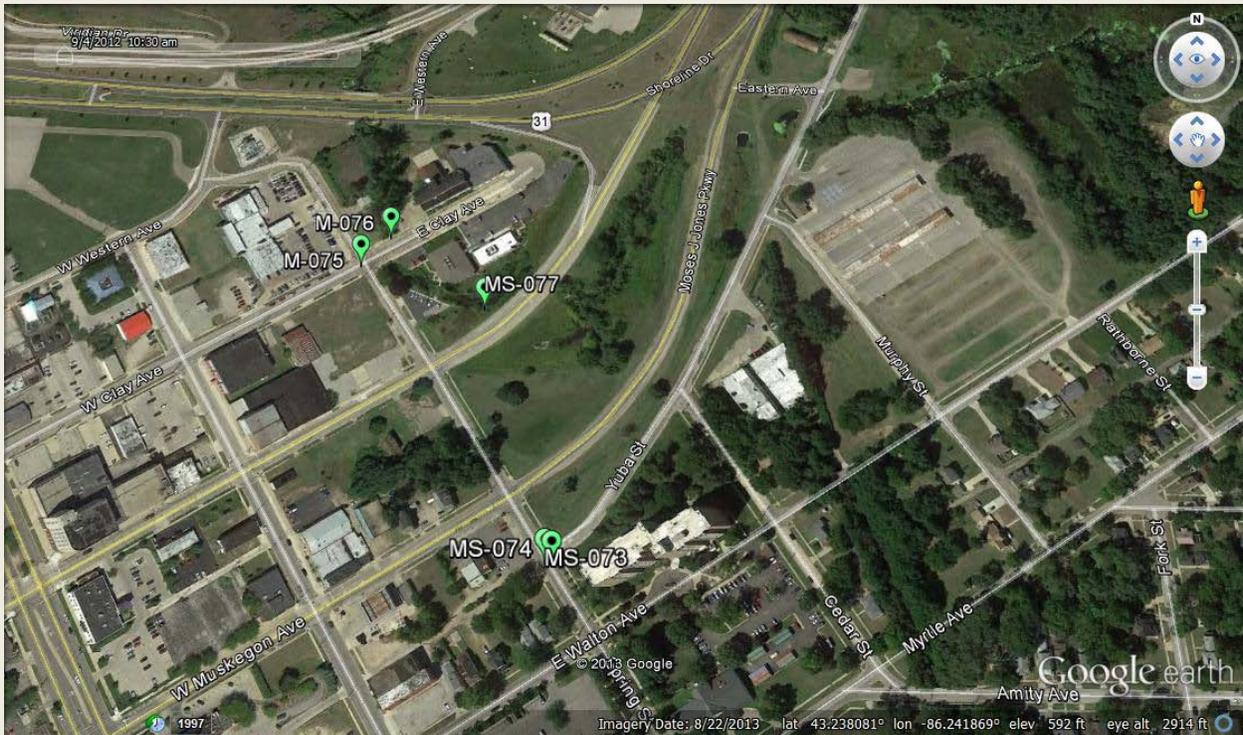


Figure 7. Spring Street results from 2012

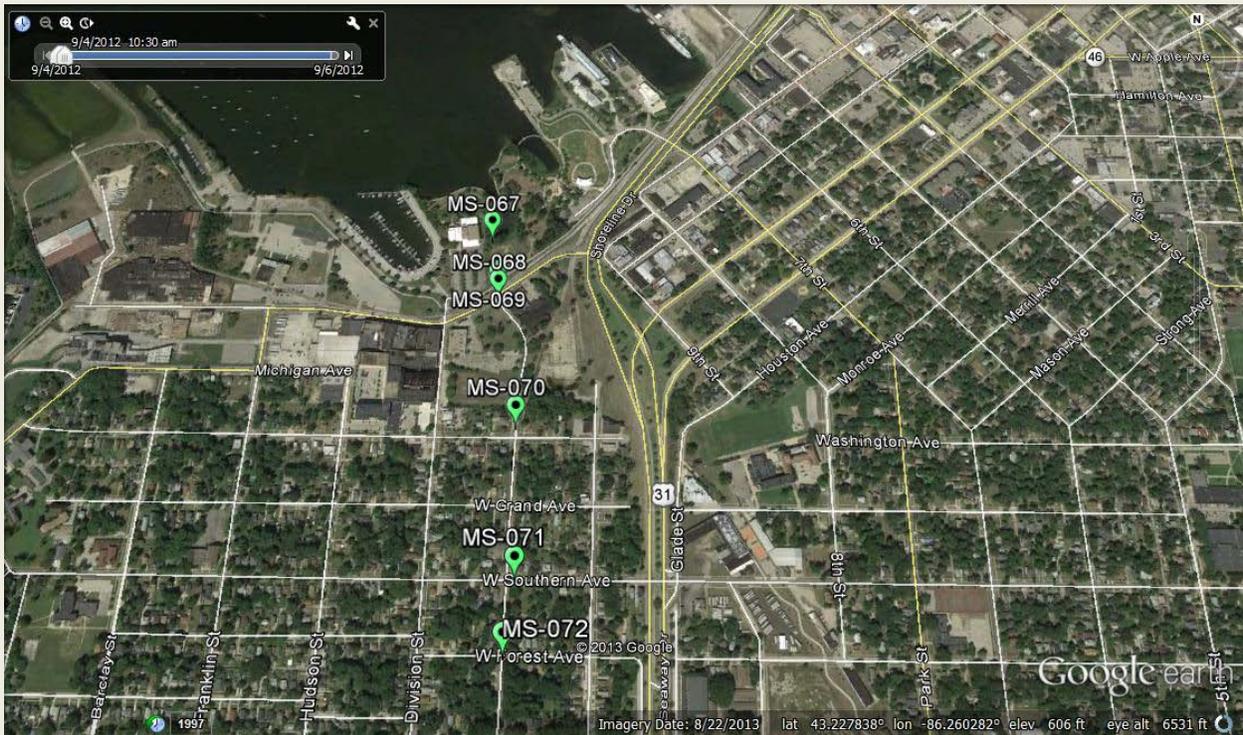


Figure 8. Henry to Shoreline results from 2012